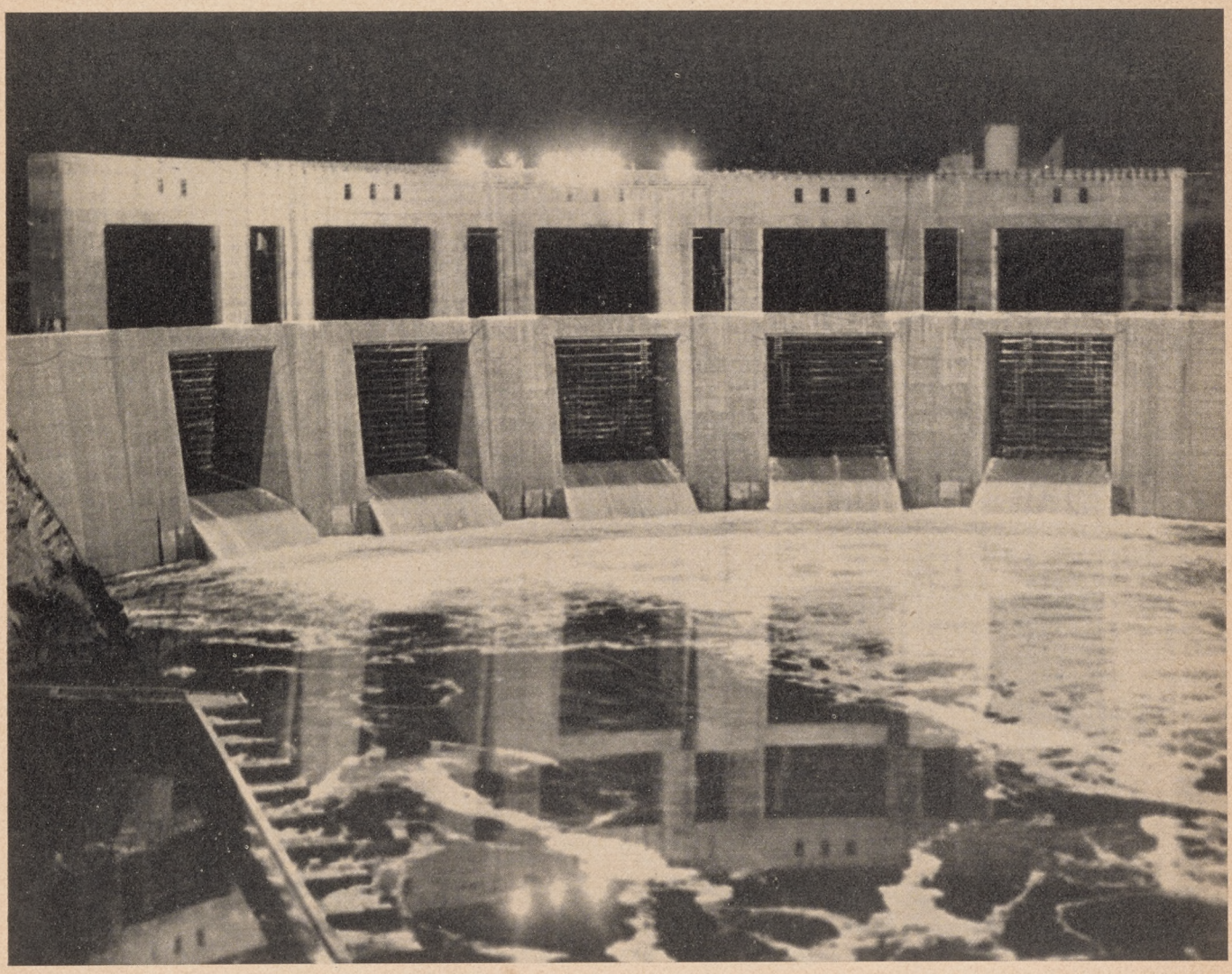
• COLORADO RIVER •

AQUEDUCT NEWS

THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

Vol. V JULY 15, 1938 No. 13



First Water Flows Through Parker Dam Gates, 7:32 P. M., July 1, 1938.

SPECIAL PROGRESS EDITION

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• COLORADO RIVER •
AQUEDUCT NEWS
THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA
306 WEST THIRD ST.
LOS ANGELES, CALIFORNIA

Published twice monthly in the interest of Field and Office Workers on the Colorado River Aqueduct, and for the information of all other citizens of the Metropolitan Water District.

Vol. V July 15, 1938 No. 13

Parker Dam Placed In Operation On July 1

Frank Crowe and his Parker Dam construction crews put the Colorado River back in its place on July 1.

The final closure of the second of the two 29-foot diameter diversion tunnels, which have been carrying the river's flow around the dam site during the construction period, was completed at 9:29 A. M. on July 1. The river had been slowly rising back of Parker Dam during the plugging operations, and at 7:32 P. M. the first water slithered through the five giant gate openings and across the spillway crest to drop over the downstream face of the dam, and continue its course down the channel of the river.

Once more the Colorado River had been harnessed, and Parker Dam had been put into operation preparatory to the day when the Colorado River Aqueduct will start taking water from the lake back of the dam and transport it across the state of California to the thirteen cities of the Metropolitan Water District.

The work of closing the second diversion tunnel (the first tunnel was closed a number of weeks ago) was started at 4:00 P. M. on Wednesday, June 29. The closing-off of the upstream portal of the 1700-foot tunnel was accomplished by use of the steel arch forms originally employed in placing the concrete lining of the tunnels.

The upper sections of these arch forms were lowered horizontally into the stream with the bases of the forms resting in channels in the concrete face of the tunnel portal. Each of these forms is four feet wide, and stacked one on another, they created a steel arch dam, 44 feet high, which sealed off the river and forced it back into its old channel.

The river submitted gracefully as the

(*Continued on Page* 16)

Construction of Colorado River Aqueduct Nears Completion

By **F. E. WEYMOUTH**
General Manager and Chief Engineer, M. W. D.

On July 1, 1938, the initial program of construction on the Colorado River Aqueduct was 85 per cent completed. It is expected that the aqueduct will be ready to begin the delivery of water by the middle or latter part of 1939.

The Metropolitan Water District project is made up of two principal parts, the main aqueduct which has a length of 242 miles, and the distributing system which is now being constructed to one-half capacity and has an initial length of approximately 150 miles.

The water-carrying features of the main aqueduct consist of 92 miles of 16-ft. diameter tunnels, 63 miles of concrete-lined canals, 55 miles of 16-ft. diameter concrete conduits, and 29 miles of inverted siphons.

On the main aqueduct all tunnels have been excavated and lined with the exception of the San Jacinto tunnel. Of this 13-mile tunnel, approximately 1.3 miles remain to be excavated and about six miles are yet to be lined. All of the conduit, lined canal and siphon construction work has been completed.

In addition, the main aqueduct includes Parker Dam, five pumping plants, three reservoirs, and a 237-mile-long high-voltage electric transmission line from Boulder Dam to the pumping plants. The first water went over Parker Dam on July 1. The reservoirs and transmission line are completed, and 75 per cent of the major equipment has been installed in the five plants which will lift aqueduct water a total of 1617 feet over the mountains that lie between the Colorado River and the metropolitan area.

The distributing system consists of the Cajalco Reservoir (the terminal reservoir of the main aqueduct), 16 miles of 10-ft. diameter tunnels, the Morris Dam reservoir, and 134 miles of various sizes and types of pipe lines to carry water to each of the 13 cities in the District.

The 65-mile "upper feeder" of this line, reaching from the outlet of the Cajalco reservoir to San Rafael tunnel No. 2, is now completed with the exception of three canyon crossings. Construction is under way on 17.4 miles of the Palos Verdes cross-feeder, and on July 1 the District's Board of Directors authorized the construction of the remaining lines in the initial development of the system.

With construction work on the aqueduct now 85 per cent completed, it is evident that this project, as provided for under the 1931 bond issue, will be built, and made ready to place in operation at a cost well under the bond issue estimate.

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Monrovia Tunnel No. 4, L. E. Dixon Co., Bent Bros., Inc., and Johnson, Inc.

(Canal, Siphon, Conduit)

Schedules Nos. 14, 15 and 16, Thompson - Starrett Co., Inc., Rodney Smith, Gen. Supt.; V. H. Wiese, Engineer.

Schedules Nos. 18, 19 and 20, J. F. Shea Co., Inc., Gilbert J. Shea, Gen. Mgr.

(Distribution Pipe Line)

Schedules 6P and 7P, J. F. Shea Co., Inc., Gilbert J. Shea, Gen. Mgr.

Schedules 9P, 10P, 11P, United Concrete Pipe Corp., John Huber, Plant Supt.; Roy Richards, Construction Supt.

Schedules 8C, 9C, 12C, Basich Bros.; Dick Noble, Supt.

Schedules 21SC, 22SC, 23SC, J. F. Shea Co., Gilbert J. Shea, Gen. Mgr.; C. A. Shea, Jr., H. F. Rennebohm, Supts.

Distribution Headworks, The Contracting Engineers Co.; Julian Huddelston, Supt.

(Dams)

Cajalco dam, The Griffith Co., Franz Fohl, Gen. Supt.

Parker Dam, J. F. Shea Co., Frank Crowe, Gen. Supt., H. P. Bunger, Constr. Eng., U.S.B.R.

Gene Wash dam, Copper Basin dam, J. F. Shea Co., Frank Crowe, Gen. Supt.

(Pumping Plants)

Hayfield, Dixon and Case, W. N. Evans, Supt.

A TUNNEL PORTAL

Director P. H. Greer and party inspect (October 15, 1935) the west portal of the Colorado River Tunnel, shortly after the tunnel had been lined with concrete. This is the first of the 38 tunnels on the aqueduct which have a total length of 108 miles. The 92 miles of tunnels on the main aqueduct have 16-foot lined diameters.

The Need For A Supplemental Water Supply

Southern California's water budget has long been unbalanced. The region's rate of water consumption has been exceeding its dependable income from all sources, a process made possible by borrowing from our age-old accumulated water capital in the sand and gravel banks of underground storage.

Hydrographic investigations and annual audits of the water ledger reveal a daily overdraft of 200 million gallons. That the next major drouth period would mean widespread water bankruptcy has been made clearly evident from the rapid recession of water levels in thousands of pumped wells, many of which were once strongly artesian.

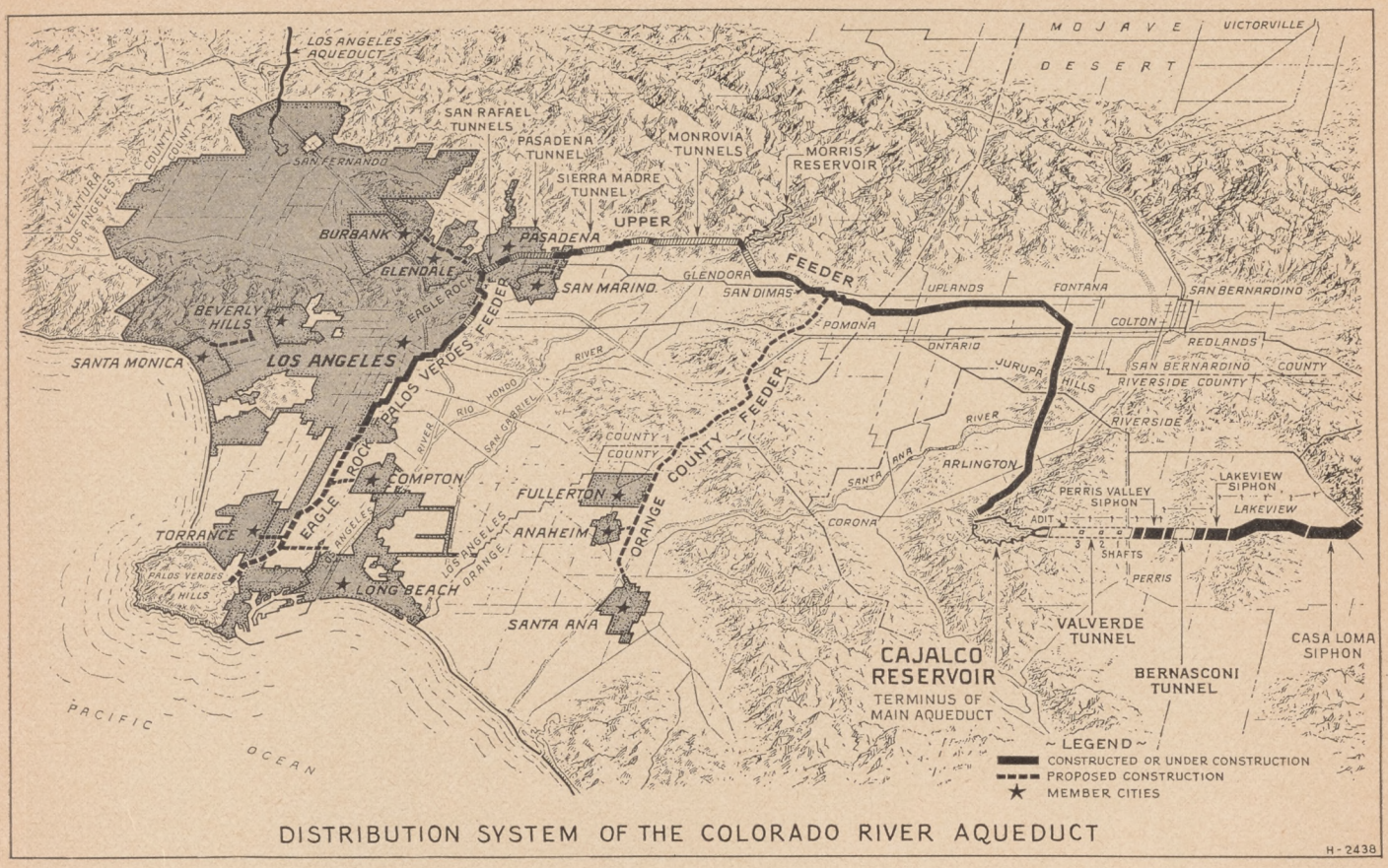
This heavy overdraft has resulted from the lack of balance between the diminishing yield of local water supplies and the factor of expanding requirements. A supplemental water supply is urgently needed:

(1) To replenish accumulated overdrafts.

(2) To provide insurance against severe drouths, which have occurred frequently in the past and reasonably may be expected in future years.

(3) To assure an ample and dependable water supply for future urban and industrial expansion.

In brief, the Coastal Plain of Southern California is now taking from the ground and using more water than nature or man is replacing. Additional water MUST be provided to sustain the present state of development and assure future growth.



DISTRIBUTION SYSTEM OF THE COLORADO RIVER AQUEDUCT

H-2438

Board Authorizes Construction of Remaining Laterals

On July 1, 1938, the Board of Directors of the Metropolitan Water District authorized the General Manager and Chief Engineer to proceed with approximately $7,000,000 worth of construction work required to complete the initial development of the distributing system of the Colorado River Aqueduct.

The Board's action was based on policies adopted by that body in 1931, prior to the District bond election, in which it was stated:

"The Metropolitan Water District will deliver water, either directly or indirectly, through a system provided by the District, to each of the eleven original member cities, and to those cities whose applications for admission prior to March 1, 1931, have been approved (all of the 13 cities now members were admitted to the District prior to that date), at or near the boundary of each, this point of delivery to be determined by considerations of economy and convenience with respect to the general engineering plans adopted by the District, and to such other points as the Directors may determine."

It was also determined at that time that, "distribution lines and other readily divisible features, should have an initial capacity sufficient to supply the water need up to about 1950".

To carry out these policies, the aqueduct's distributing system has been designed to carry water to each of the thirteen District cities at a minimum of initial construction cost, and at the same time to provide an efficient system which may be economically expanded to meet increased future water demands.

At the present time, approximately 63 miles of the upper feeder of the distributing system has been completed. This line extends from the Cajalco reservoir to the west portal of San Rafael tunnel No. 2, which is located in Glendale. It has a capacity of 750 cu. ft. per second between Cajalco and San Dimas Wash and a capacity of 510 c.f.s. for the remainder of its length. A direct connection from this line will serve the City of Pasadena and another short lateral will serve San Marino.

Construction is also under way at the present time on 17.4 miles of the northern section of the Palos Verdes cross-feeder which will serve the cities of Los Angeles, Torrance, Compton, and Long Beach.

The work authorized by the Board of Directors on July 1 includes the necessary laterals and other works to carry water from the upper feeder to the other District cities.

This will mean the extension of the Palos Verdes cross-feeder south of its present terminus at 98th and Wadsworth Streets in Los Angeles to 223rd Street, with laterals to Compton, Torrance, and Long Beach. It will also include the extension of this line to, and the construction of, an operating reservoir in the Palos Verdes Hills.

Glendale and Burbank will be served with a lateral to be built from the end of San Rafael tunnel No. 2.

Beverly Hills and Santa Monica are expected to be served by exchanging water with the City of Los Angeles, and connecting these cities with the Los Angeles distributing system. If such a program is not completed, these cities will be served by an extension of the Burbank lateral.

Present plans call for serving the Orange County cities, Fullerton, Anaheim, and Santa Ana, with a lateral connecting to the upper feeder in the vicinity of La Verne. If Orange County as a whole, or a substantial part of it, should annex to the District at an early date, the La Verne lateral will not be built, and an independent line will be built into Orange County directly from the Cajalco reservoir.

TYPICAL LINED CANAL

An aqueduct canal section in the vicinity of Iron Mountain showing the recently completed fences which enclose all canals. There are 63 miles of these concrete-lined canals on the aqueduct—all completed. They are built on flat desert stretches between the Colorado River and the Hayfield pumping plant.

Highlights in History of Aqueduct Project

In 1923, the City of Los Angeles, which already had gone to the High Sierras for supplemental water, began the first surveys and studies for the construction of an aqueduct to the Colorado River.

Many other communities recognized a need for water fully as acute as that of Los Angeles, but as individual cities they could not hope to finance the Herculean task of building a waterway to the Colorado.

The problem was solved by the drafting of the Metropolitan Water District Act which was passed by the Legislature of the State of California in 1927. Under this Act, The Metropolitan Water District of Southern California was organized in 1928. This District now includes thirteen Southern California cities.

Shortly after its formation, the District took over the work already begun by the City of Los Angeles. During this period (1923-1930) the City had practically completed the tremendous topographic surveys that were necessary to locate the aqueduct route.

On September 29, 1931, the citizens of the Metropolitan Water District voted a $220,000,000 bond issue, by a majority of 5 to 1, to finance the construction of the Colorado River Aqueduct.

Actual construction work on the aqueduct was started in December, 1932.

CONSTRUCTION PROGRESS

June 16 to 30, 1938

TUNNEL (MILES)	EXCAVATION Completed	EXCAVATION Remaining	LINING Completed	LINING Remaining
Aqueduct	90.83	1.28	85.89	6.22
Distribution	16.25	0.42	16.16	0.47
Total	107.08	1.70	102.05	6.69

CANAL, CONDUIT AND SIPHON (MILES)	Completed	Remaining
Excavation	145.60	0.01
Concrete	144.42	0.14
Backfill	80.70	0.14

DISTRIBUTION PIPE LINE (MILES)	Completed	Remaining
Excavation	52.45	10.77
Concrete	52.12	11.10
Backfill	50.89	12.33

TUNNELS

AQUEDUCT

CONTRACTOR	TUNNEL	LENGTH IN FEET	EXCAVATION IN FEET: NUMBER OF SHIFTS	AVERAGE PER SHIFT	THIS PERIOD	TOTAL TO DATE	REMAINING	LINING IN FEET: ARCH OR INVERT	NUMBER OF SHIFTS	AVERAGE PER SHIFT	THIS PERIOD	TOTAL TO DATE	REMAINING
THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA	SAN JACINTO										*(551)	(36,026)	(32,817)
	Cabazon Shaft to East Portal	8,880		Completed		8,880	0	Arch	0	0	0	8,484	396
								Invert	0	0	0	8,484	396
	Cabazon to Lawrence	26,809	45	7.9	356	23,629	1,049	Arch	0	0	0	6,973	19,836
	Lawrence to Cabazon		45	3.7	168	2,131		Invert	0	0	0	6,972	19,837
	Lawrence to Potrero	17,672	45	4.1	184	1,263	5,692						
	Potrero to Lawrence		45	7.2	326	10,717		Arch	15	45.9	689	5,361	12,311
								Invert	0	0	0	6,112	11,560
	Potrero Shaft to West Portal	15,482		Completed		15,482	0	Arch	0	0	0	14,953	529
								Invert	0	0	0	15,482	0
	TOTALS Ft.	68,843	180	5.7	1,034	62,102	6,741	Arch	15	45.9	689	35,771	33,072
	Miles	(13.04)			(0.19)	(11.76)	(1.28)	Invert	0	0	0	37,050	31,793

*Invert considered to equal 0.2 and arch 0.8 of completed section.

DISTRIBUTION

WEST CONSTRUCTION CO.	MONROVIA NO. 3	32,105		Completed		32,105	0				0	32,095	0
J. F. SHEA CO., INC.	ROCKDALE (Schedule 21SC)	262	11	7.5	83	262	0				0	0	262
	OAKHILL (Schedule 21SC)	597			0	0	597				0	0	597
	ASCOT (Schedule 21SC)	1,622			0	0	1,622				0	0	1,622
	TOTALS Ft.	34,586	11	7.5	83	32,367	2,219				0	32,095	2,481
	Miles.	(6.55)			(0.02)	(6.13)	(0.42)				0	(6.08)	(0.47)

Canal, Conduit, Siphon and Pipe Lines

AQUEDUCT

SCHED. NO.	CONTRACTOR	FEATURES	Length In Feet	EXCAVATION—Feet: Period	To Date	Remain'g	CONCRETE—Feet: Period	To Date	Remain'g	BACKFILL—Feet: Period	To Date	Remain'g
20 A & B	M. W. D.—FORCE ACCT.	Siphon	752	0	705	47	0	0	752	0	0	752

DISTRIBUTION PIPE LINES

9-P	UNITED CONC. PIPE CORP.	Precast Concrete Pipe	8,697	0	8,388	309	0	8,388	309	0	8,388	309
8C-9C-12C	BASICH BROTHERS	Cast-in-Place Conc. Pipe	1,656	0	1,398	258	129	978	678	143	698	958
21SC	J. F. SHEA CO., Inc	Welded Steel Pipe	26,449	1,727	7,332	19,117	1,805	7,233	19,216	2,405	3,300	23,149
22SC			28,310	0	0	28,310	0	0	28,310	0	0	28,310
23SC			34,470	3,855	25,594	8,876	3,875	24,369	10,101	3,021	22,089	12,381
	TOTALS		99,582	5,582	42,712	56,870	5,809	40,968	58,614	5,569	34,475	65,107

Miscellaneous Construction

PARKER RESERVOIR—SIX COMPANIES, INC.

FEATURES	Est. Quan.	Period	To Date	Per Cent
Diversion Tunnels—Excav.	3,463 Ft.	0	3,463	100
Diversion Tunnels—Concrete	3,363 Ft.	0	3,363	100
Cofferdams—Excav.	227,582 C.Y.	0	227,582	100
Cofferdams—Fill	464,890 C.Y.	0	464,890	100
Outlet Works—Excav.	220,000 C.Y.	634	207,935	100
Outlet Works—Concrete	5,000 C.Y.	86	5,286	100
Dam—Excavation	1,508,200 C.Y.	0	1,524,336	100
Dam—Concrete	297,900 C.Y.	160	291,135	99
Power House—Excav.	58,000 C.Y.	0	56,782	100
Power House—Concrete	14,000 C.Y.	0	15,414	100

AQUEDUCT PUMPING PLANTS AND APPURTENANT WORKS

PLANT	CONTRACTOR	PER CENT COMPLETED: Excavation	Concrete	Steel Erect'n
INTAKE	WINSTON BROS. CO. & WILLIAM C. CROWELL	100	100	100
GENE		100	100	100
IRON MT.	WOOD & BEVANDA	100	100	100
EAGLE MT.	L. E. DIXON CO.	100	100	100
HAYFIELD	L. E. DIXON & CASE CONST. CO.	100	98	97

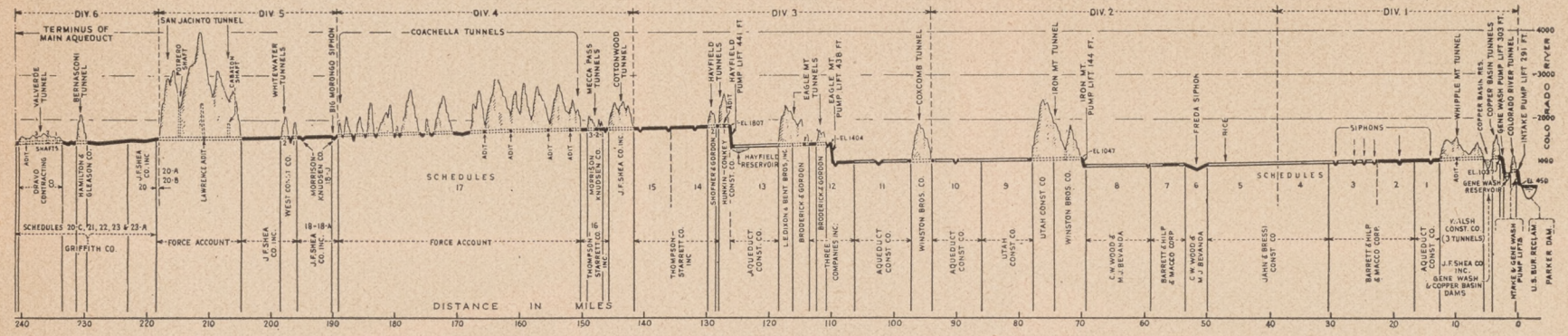
GENE WASH RESERVOIR—J. F. SHEA CO., INC.

FEATURES	Est. Quan.	Period	To Date	Per Cent
Dam—Excavation	7,500 C.Y.	0	7,500	100
Dam—Concrete	14,339 C.Y.	0	14,333	100
Spillway—Excavation	4,762 C.Y.	0	4,762	100
Spillway—Concrete	4,729 C.Y.	0	4,729	100
Dike—Excavation	1,700 C.Y.	0	1,700	100
Dike—Fill	8,700 C.Y.	0	8,700	100
Dike—Concrete	927 C.Y.	0	927	100

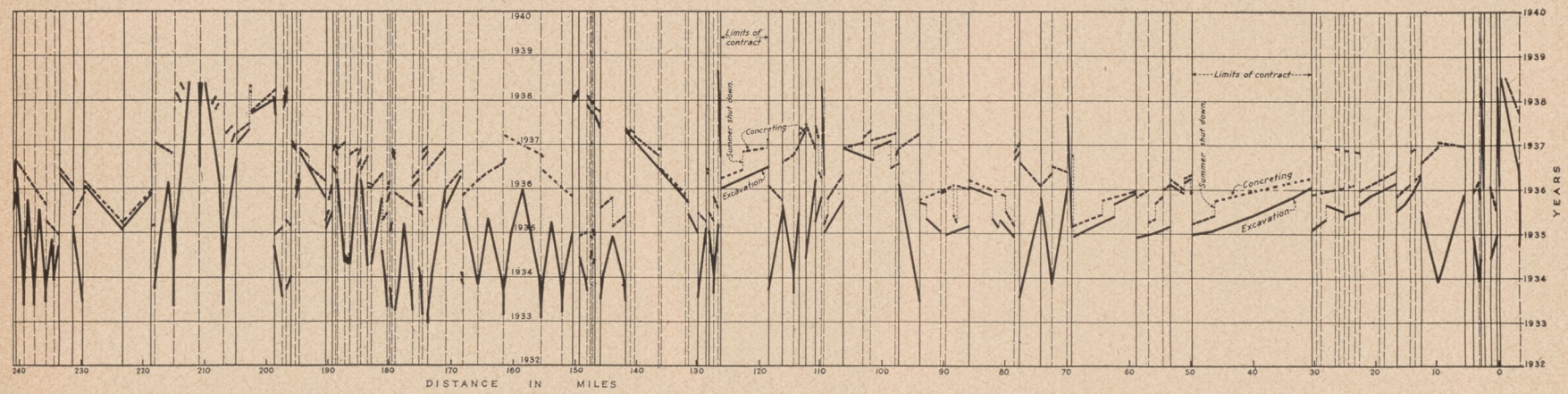
COPPER BASIN RESERVOIR—J. F. SHEA CO., INC.

FEATURES	Est. Quan.	Period	To Date	Per Cent
Dam—Excavation	8,700 C.Y.	0	8,700	100
Dam—Concrete	18,000 C.Y.	0	17,986	100
Spillway—Excavation	8,000 C.Y.	0	8,000	100
Spillway—Concrete	2,177 C.Y.	0	2,177	100
Outlet Works—Excavation	Lump Sum	8%	98%	98
Gate House Superstructure				
Clearing Reservoir Site	427 Ac.	0	423	99

For Those Who Want to Know "How" and "When"



PROFILE



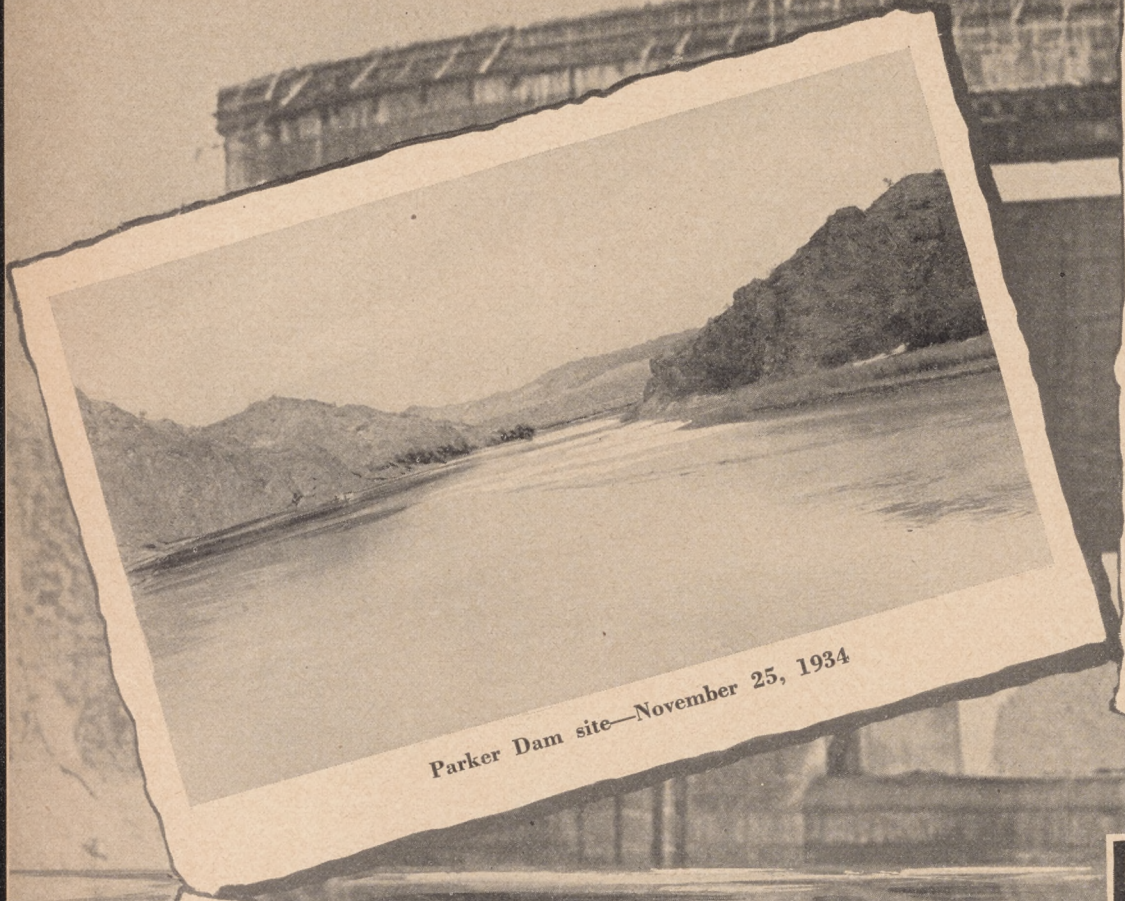
PROGRESS OF CONSTRUCTION WORK ON COLORADO RIVER AQUEDUCT

Shown above is a profile of the main aqueduct, and a construction progress chart covering the same sections of the line. The latter chart was prepared by D. B. Gumensky of the Design Division of the Metropolitan Water District, and is an accurate representation of the progress made in connection with the two principal items of construction—excavation and concreting.

The progress chart is read directly in connection with the profile, that is, the limits of the various schedules as shown on the profile are brought down vertically into the progress chart. The solid lines indicate excavation progress, and the dotted lines indicate concreting progress. The lowest point on each line indicates the year and the geographic position on the schedule where construction was started. The lines tilt in the direction (east or west) that the work was carried on. The highest point on each line indicates when the work was completed. The year scales are printed on the extreme right, and in the left center. The aqueduct distance of each feature from the Colorado River is shown at the bottom.

As shown on this chart, the only uncompleted water-carrying feature on the main aqueduct is the San Jacinto tunnel. Excavation of that 13-mile tunnel was started in the spring of 1933. On July 1, 1938, approximately 1.3 miles of the tunnel remained to be excavated, and 6 miles remained to be lined with concrete. The San Jacinto tunnel is the second longest on the aqueduct, the longest being the 18-mile East Coachella tunnel.

Including the distributing system, the construction of the Colorado River Aqueduct requires the excavation of approximately 41 million cubic yards of earth and rock, and the placing of 5,000,000 cubic yards of concrete. More than 7,500,000 barrels of cement are required to make this concrete.

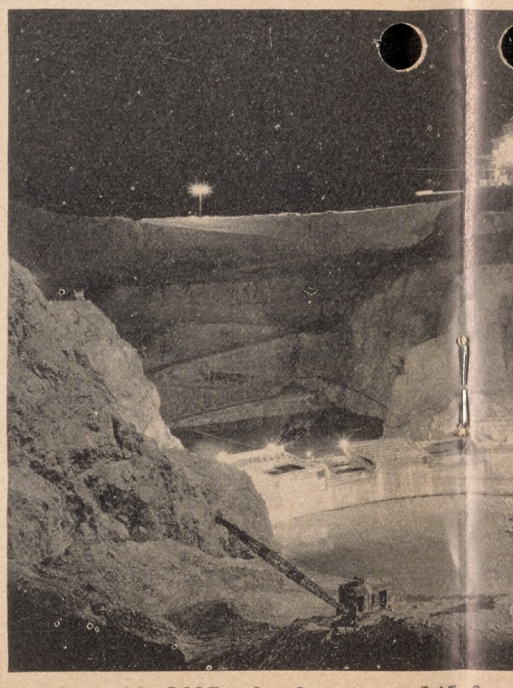


Parker Dam site—November 25, 1934

First concrete placed—243 feet below

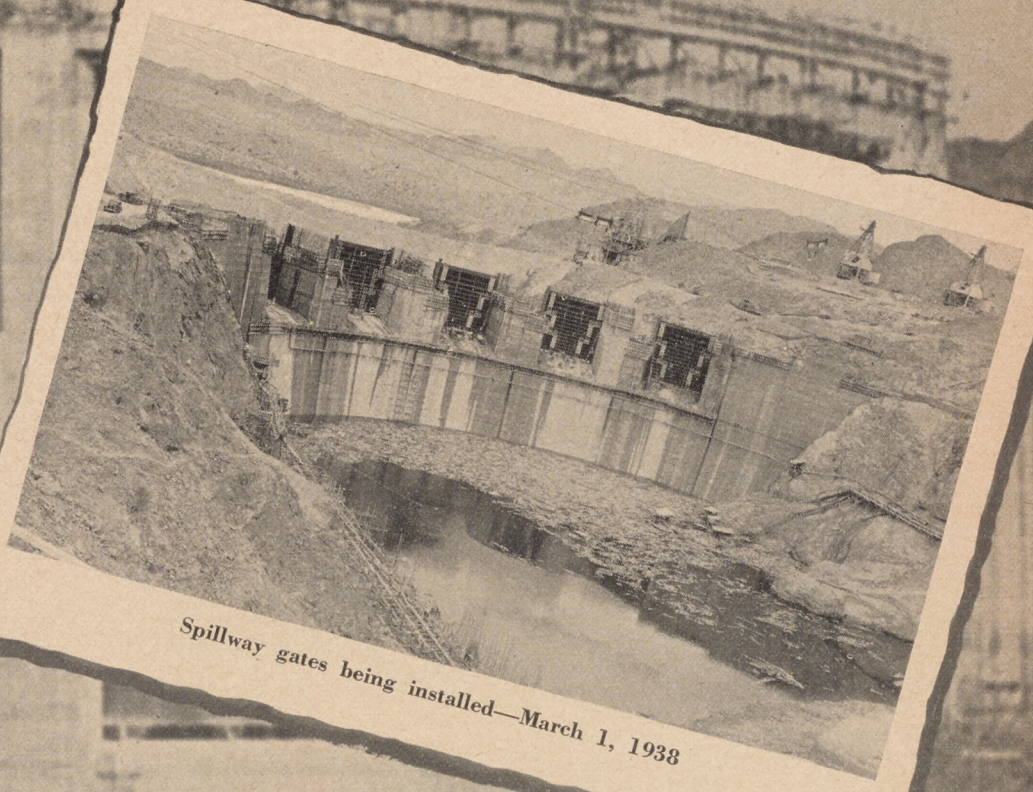
PARKER

Eighty-eight feet below river surface—excavating for bedrock, Feb. 17, 1937



Sept. 29, 1937—the dam is up 145 feet.
bottom of excavation s

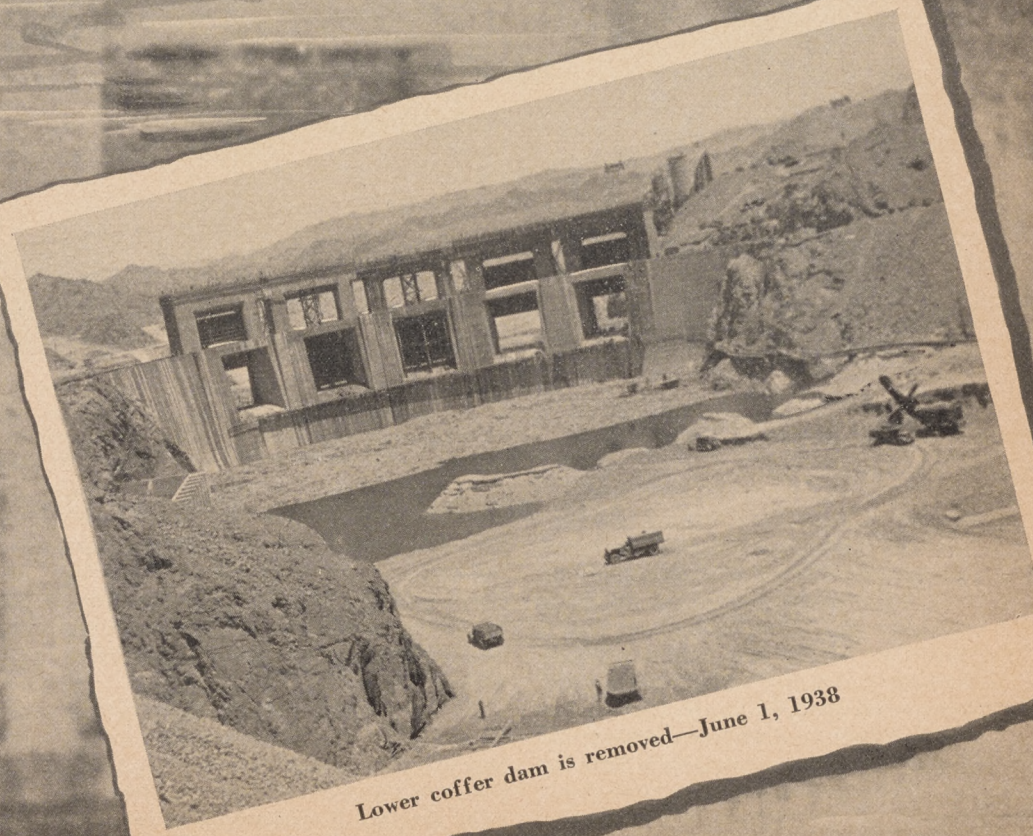
et below river surface, July 29, 1937



Spillway gates being installed—March 1, 1938

R DAM

145 feet, but is still 10 feet below the
cavation shown at left



Lower coffer dam is removed—June 1, 1938

COMPLETING LAST CONDUIT SECTION

Construction of the last of the 55 miles of 16-foot diameter concrete conduits on the main aqueduct. Picture shows the final section east of Cabazon, Calif., which was completed May 5, 1938. The conduits are constructed in deep trenches, and are covered with earth from 3 to 30 feet in depth.

The Metropolitan Water District

The Metropolitan Water District of Southern California was organized in 1928 under an act passed by the State Legislature in 1927. This act is, in effect, the charter of the Metropolitan Water District. It sets up the powers of the District. It provides a new type of municipal corporation wherein separate incorporated cities and county water districts may organize a metropolitan water district for the purpose of financing, building and operating a water system.

Under this act, the District is governed by a Board of Directors, each city having at least one representative, and no city, regardless of size, being permitted to exercise more than 50 per cent of the governing power. The directors serve without pay.

At the present time the Metropolitan Water District is composed of the following cities: Anaheim, Beverly Hills, Burbank, Compton, Fullerton, Glendale, Long Beach, Los Angeles, Pasadena, San Marino, Santa Ana, Santa Monica and Torrance.

The amount that each city is responsible for in connection with the cost of building and operating the aqueduct is based upon the proportion of the assessed valuation of that city to the total assessed valuation of the entire District. In a like manner the District cities share in the benefits of aqueduct water.

The District will not distribute water to individual consumers. It will deliver Aqueduct water to each member city, which, in turn, will serve its own water users.

DESIGN

Controlling Factors in the Location and Design of the Aqueduct.

By Julian Hinds,
Assistant Chief Engineer, M. W. D.

Any attempt to catalog and discuss all the factors which had a controlling influence on the location and design of the Colorado River Aqueduct and its various features would involve an endless statement of rather uninteresting details. It is possible here to mention only a few of the more important points.

The first problem, of course, was the determination of the need for water, the amount to be provided, and the source. These problems have been discussed in preceding papers. The Colorado River has been shown to be the "last water hole," and the need for an average diversion capacity of 1500 second feet has been established. In preparing plans for the aqueduct, the capacity was set at 1605 second feet to allow for unavoidable shutdowns for maintenance and repairs.

Generally, in planning a water system, the selection of the source largely determines the location and nature of the project. For the Colorado River Aqueduct, this was not true. The aqueduct might, conceivably, divert at any of a number of points all the way from the mouth of the river in Lower California to Glen Canyon in Utah, and might conceivably follow any of many widely separate routes across the Southern California desert. Because of the complexity of the problem and the many balancing factors, it was not possible to select by general inspection the two or three alternative routes worthy of detailed study. The problem had to be studied in a widespread manner, covering a vast area, in order that no worthy possibility might be overlooked.

The problem was complicated by an important psychological element. The development of the Colorado River has long been subject to romantic speculation. The coastal basin in which Los Angeles is situated is capable of almost unlimited development except for the lack of water. The idea of transporting a portion of the flow of the Colorado River into this potential empire has long held a firm grip on the imagination of the people. Individuals in all walks of life have dreamed of great dams on the Colorado River and great waterways leading to thirsty desert areas.

Rapid expansion in Southern California in the early part of the present century, with the consequent exhaustion of local water sources, gave great impetus to these dreams. Community leaders and particularly those responsible for water supply began to search for a means of making some of these dreams come true. The public soon followed suit, and plans for the development of the Colorado River sprang up in great numbers. Proposals were submitted by hard-headed engineers with their feet on the ground; by visionary promoters, sometimes sincere and sometimes with an axe to grind; and by a multitude of citizens between these two extremes. Prior to the organization of The Metropolitan Water District of Southern California, many of these schemes had been widely publicized. The public was interested and naturally "took sides." Every advertised plan had its following.

If the project were to go forward, it must be founded upon the confidence of the public. The necessary funds must come from the taxpayers and water users. The people must vote the bonds with which to accomplish construction work, and to this end must approve the adopted scheme. Consequently, the District's engineering staff and its Board of Directors found it necessary not only to satisfy themselves as to the most acceptable plan, but also to sell their conclusions to the public. To adopt a plan that could be proved sound and practicable was not enough. Each of the many preconceived schemes had its "boosters." The virtues of each were being widely acclaimed, although little was being said about shortcomings. Naturally, some of the schemes had "holes" in them—some serious, some insignificant. Many of these holes had been so smeared over with propaganda that they were difficult to see. It was necessary that each scheme be cleansed by careful analysis and hung out on the line of public opinion in such clear light that all might see both faults and virtues.

One of the most popular notions was that there should be no pumping. Popular opinion among both water men and laymen has always favored a gravity supply for a metropolitan area. Such a supply has many advantages. It was natural that many of the schemes for developing the Colorado River should propose gravity delivery of water to Southern California, and it was proper that all such proposals should be carefully studied.

An ambitious plan contemplated a high dam on the Colorado River and high-level diversion at Glen Canyon, far upstream from the Grand Canyon, with an enormous canal some 800 miles long leading to Los Angeles and serving on its way large areas in Utah, Nevada and California. Another gravity scheme contemplated a diversion dam 900 feet high at Bridge Canyon, near Kingman, Arizona, with a gravity line to the coastal area. Such a plan involved the construction of tunnels of enormous length—sometimes under mountain ranges and sometimes deep beneath the surface of water-filled alluvial plains.

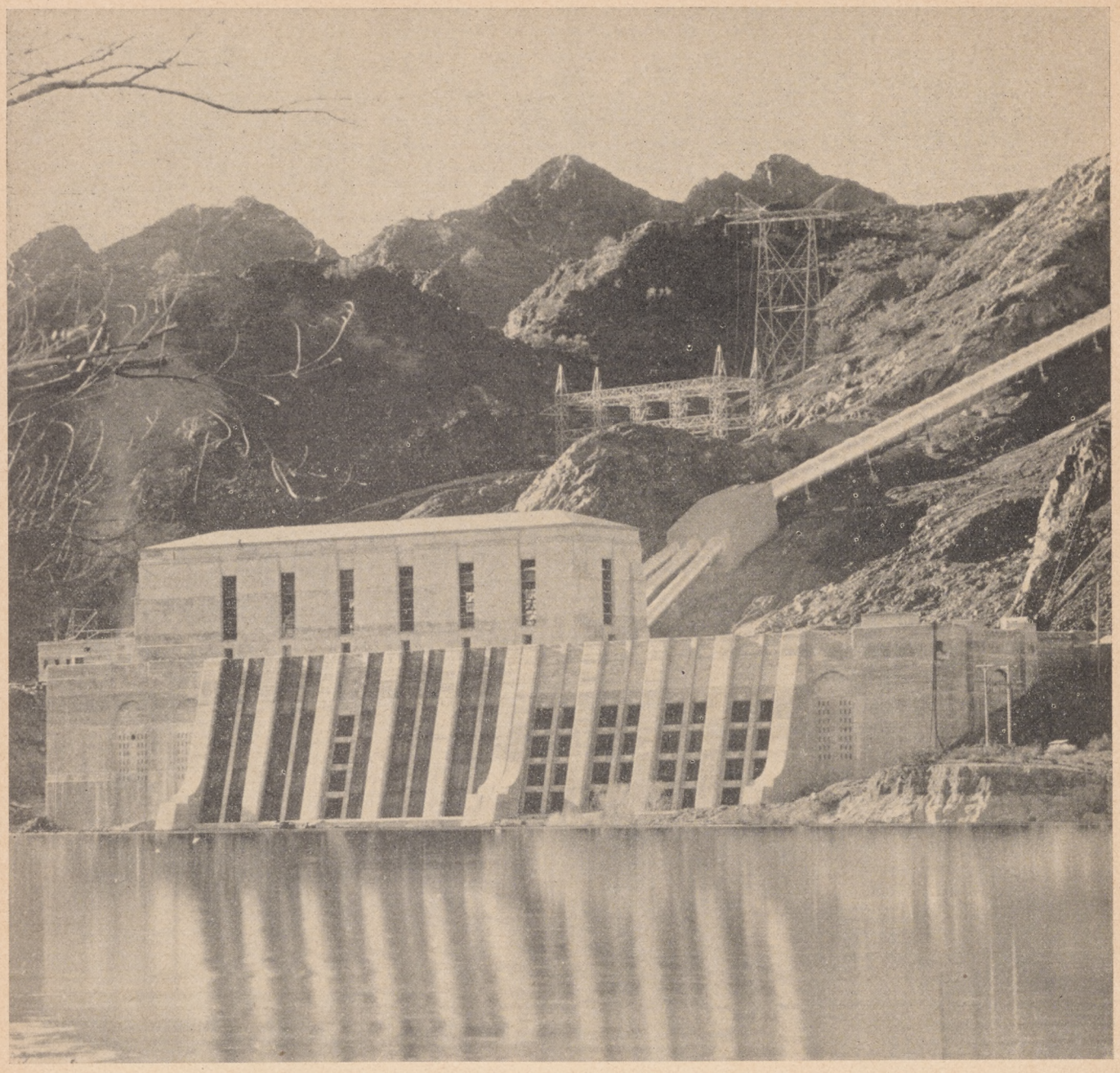
Another interesting proposal was a single tunnel from a point near Monrovia straight into the reservoir at Boulder Dam. This plan was investigated in detail both from an engineering and a geological point of view. The proposed tunnel lay deeply buried in alluvial fills and passed under, rather than through, mountain ranges known to be badly fractured and faulted. It was found to be impracticable if not actually impossible to construct. Even if built, it would not have entirely eliminated pumping. Its terminal elevation was about 400 feet above sea level, while much of the area in need of Colorado River water lies above that elevation.

Each of these schemes was carefully considered. In the end, it was necessary that they be dismissed as physically and financially impossible, or at best, as involving expenditures out of all proportion to benefits; and thus the project acquired a pumping problem.

One difficulty with the gravity schemes was the rigid restrictions imposed on the elevation and horizontal location. Lack of flexibility in fitting the line to ground conditions and inability to choose the general location necessitated costly construction. With the introduction of pumping, these restrictions were partially removed. Diversion could be made at any of several convenient points on the river and by distributing the pumping plants along the line, the aqueduct could be fitted to the ground in the most economical manner. This introduced the problem of finding the best location out of many possibilities.

It was necessary to establish an economic relationship between cost of pumping, length of aqueduct, percentage of tunnel in the line, and size and type of conduits. The cheapest place to pump the water for a given lift was at Boulder Dam, as the cost of transmission was eliminated. Also, the low water level of 895 feet in Boulder Reservoir is considerably higher than the river level at any other available diversion point. At first glance, this indicated a lower pump lift.

(To Be Continued.)



INTAKE PUMPING PLANT

The Intake pumping plant "gets its feet wet" on July 1 as the rising water of Parker Lake backs up into the plant. This plant marks the beginning of the Colorado River Aqueduct, and is the first of five pumping plants which will lift the aqueduct water a total height of 1617 feet.

Building the Colorado River Aqueduct

On Christmas Eve, 1932, the Metropolitan Water District sent the first crew of workmen out into the field to start the actual construction of the Colorado River Aqueduct.

Since that date, more than 35,000 men have been directly employed on this big project. These men have been residents of the cities of the Metropolitan Water District. It is the policy of the District's Board of Directors that a person working on the job is required to be a bona fide resident of some one of the thirteen cities in the District for at least one year prior to the time of employment. The number of employees from any one city working on the aqueduct at any one time is governed by that city's share in the cost of the construction of the aqueduct.

In addition to those directly employed on the job, it is estimated that an additional 25,000 persons have been annually employed throughout the United States manufacturing the material, supplies, and equipment that have been used during the construction period.

On July 1, 1938, District records indicated that more than 118,000 freight carloads of all types of material already had been used in building the Metropolitan Water District Aqueduct project.

NEWS FROM FIELD AND OFFICE

An uncensored necking party put on by Tobe, the pup, and Miss Jean Marie Farmer. The young lady, who seems to be enjoying the festivities as much as the pooch, is the seven months old daughter of Everett Farmer, retiring president of the L. A. Employees' Association.

An organization which has been in existence for a long time, but whose name didn't come out into the open until the water went over Parker Dam, is the ancient and honorable order of the "One C and the Busy Bees." The busy bees in this case have nothing to do with flowers and those who have the urge to make a wise crack better smile when they do so. The "One C" stands for Frank Crowe, General Superintendent for the Shea Company, and the "Busy Bees" stand for ten of his construction assistants, all of whose names begin with the letter "B." The list follows:

Frank Bryant, Assistant Superintendent; Si Bous, Master Mechanic; E. H. Baker, Carpenter Superintendent; Charley Bailey, Chief Electrician; George Bogovich, Shop Foreman; E. R. Baker, Office Manager; C. W. Bingham, Form Foreman; M. C. Butler, Timekeeper; Joe Borozaga, Masonry Foreman; and Claude Bacon, Structural Steel Foreman.

* * * *

Latest reports from the far stretches of the aqueduct show that the June wedding bells are still ringing. One of the latest to get in step with the parade is Larry Soules, engineer for the Shea Company on the construction of Parker Dam. Larry was married to Miss Betty Barrett in Pasadena on June 11. Mrs. Soules had formerly been a teacher at the Parker Dam School.

* * * *

Judging by the number of replies coming into the NEWS office since the request went out for the names of "old timers," there are apparently quite a number of the "since when" boys who are still out on the line. Before attempting to determine just who is the oldest old timer in point of service the NEWS will from time to time publish the names of these aqueduct veterans.

Among the first names received are Dave May, office engineer at Division 2, who has been on the project since October 8, 1925; Dick Stephens, office engineer at the Banning construction headquarters, has been on the job continuously since June 4, 1925, and had his first job on the aqueduct in 1923; Courtland Munn, who recently completed his work on the job, started in on the preliminary surveys around Rice in March, 1931; B. M. Mosely, road foreman at Division 1, started his aqueduct career as a cook at the Granite Pass survey camp in March, 1931.

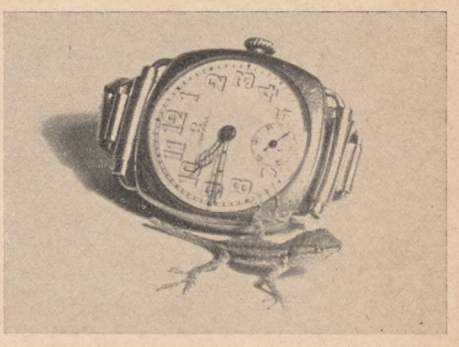
* * * *

Charles Canfield, formerly an inspector for the Distribution Division on the San Rafael tunnel, graduated from the College of Osteopathic Physicians and Surgeons this last June.

Aqueduct Temperatures

June 16 to 30, 1938

	Max.	Min.
Div. 1	113°	67°
Div. 2	112°	67°
Div. 3	110°	67°
Div. 5	99°	48°



Ben Oliver Hicks, who works for the District at Division 3 headquarters, sent in this unusual picture that he took of a tiny desert lizard. The size of the creature, which Ben trapped in a cigarette package, may be judged by comparison with the wrist watch.

The June wedding bells already mentioned seem to have an especially loud call along the Colorado River as evidenced by this note received from Division 1 Headquarters:

"Wonder why Sid Standin, telephone operator at Division 1, hasn't been passing out the Corona Coronas to the boys? After all, there are rings and rings."

* * * *

Newly elected officers of the Governing Board of the Los Angeles Employees' Association are Gene Reynolds (Los Angeles Garage), President; Marvel Murray (Right of Way), Secretary; and Harry Richardson (Accounting), Treasurer.

The East Portal (San Jacinto Tunnel) Hardrock Nite Ball team which tied with Banning Headquarters for first place for the first half of the league schedule. Back row, left to right: Lefty Sullivan, Gilmore Smalley, Supt. Charles Thomas (manager), Oscar Christensen, Tommy Walters, "Jughead" Riggins, Ted Jones, Jack Moore. Front row, left to right: Gale Wilson, Ed Myers, Connie Creim, Buddy Christensen (mascot), "Bromo" Seltzer, Harry Black, Fred Moore, and Ed Fickes.

When Public Employees Engage In Public Relations Service

By DON J. KINSEY
Assistant to the General Manager, M. W. D.

In the training of public employees for work which requires direct personal relations with the public, the first step, of course, is the proper selection of these employees. Civil Service procedure sets up standards of education and experience as bases for the selection of public employees. But, it is difficult for Civil Service to devise methods by which a system of questions and answers infallibly can reveal those peculiar personal traits, mannerisms, prejudices and social characteristics which go to make so many persons unfit for public relations work in the public service.

First of all, let us look for just a moment to the meaning of this term "public relations" in public service. During the past several years it has become widely used and at the same time frequently misunderstood and badly abused. Actually there is nothing complicated, mysterious or new about it. Public relations work of public employees should not be confused with the efforts of organized campaign workers to secure the public support of a particular ballot issue on some particular day and date.

Every public employee — Federal, State, County, City or District—whose duties require him or her to deal personally and directly with the public, is engaged in public relations work. They include information clerks, counter clerks in public offices which receive or make payments, issue licenses or permits, inspectors, publicly-owned utility meter readers and collectors, departmental representatives who appear before public gatherings to speak on public issues, clerks who answer telephone inquiries or dictate letters to the public. All these and many others actually are engaged in a basic and important form of public relations work. It is the impression which these public employees leave with Mr. and Mrs. Public which raises or lowers the esteem with which public service is held in the public mind.

Public relations in the public service means simply—public service. It is a career which carries with it a solemn responsibility. Love and devotion to service may be trite words, but they stand for fundamental qualities in those who choose to engage in public service.

Public service capably rendered may insure a fairly satisfactory state of economic security; it certainly offers no opportunities for those who hunger for great material riches. Therefore, those who have the pressing urge to accumulate great wealth should steer clear of service in any agency of government.

It is not possible to train every sort of person to perform public relations work effectively, any more than it is possible to train just anybody to be a successful diplomat or a great portrait painter. Therefore, let us give our attention primarily to those personal attributes which fit one for public relations work. There are a number of such qualities and characteristics. Some are elementary, but nonetheless important, and frequently overlooked. To be specific, these qualities and characteristics include the following:

1. *Personal cleanliness and neatness.* All too often the public employee is guilty of an untidy personal appearance that would not be tolerated in private service. In habits of dress the public employee, man or woman, should be conservative. In other words—and literally—"neat but not gaudy."

2. *Natural dignity born of self-respect.* This sort of dignity does not manifest itself by an attitude of superiority, stiff formality or arrogance. It gives expression through the employee's ability to meet the public with unfailing courtesy and serene self-assurance on the firm and friendly ground of personal equality.

3. *Full recognition of the rights and honest misunderstandings of the average citizen.* There is no place in the public service for smart alecks who think they are working for the "dumb public." The public employee should be mindful always of the fact that the average citizen and taxpayer is kept pretty busy with his own private affairs and does not have the time or opportunity to keep abreast of all public office functions and problems. That is why the taxpayers hire public servants to handle their public business. The public servant is paid to know that business, to assist the citizen in his relations with the public office, and to act capably and honestly as the agent of the people. Many citizens harbor certain misconceptions concerning public affairs. It is the business of the public employee to realize the existence of these misunderstandings, and to grasp every proper opportunity to remove them from the mind of the public.

4. *Ability to view a public issue through the eyes of the person on the other side of the counter.* A valuable public relations worker often will do more to win the citizen's support and remove the cause of a complaint by first frankly setting forth the problem as it probably appears to the citizen, and then presenting the situation as it actually exists in the light of a broader public interest.

5. *Ability to speak (or to write) calmly, clearly, definitely and—on occasion—forcefully.* This carries with it the ability to avoid arguments. It includes that rare faculty of calming the ruffled temper of a belligerent citizen with a real or fancied grievance. It calls for a person sure of his ground on the facts and the principles, and with a mind trained to hold to the main issue.

6. *Full and detailed knowledge of the public business at hand, and a broad working knowledge of public affairs generally.* Knowledge of all the facts and the ability to state such facts clearly and simply, inspires public confidence. All too frequently the public employee is charged with not knowing his job. In many instances this criticism is unjust. But the employee probably has earned the criticism by his unwillingness or inability to present the facts at issue clearly and positively. The criticism, whether just or unjust, once lodged against the employee comes to rest unfavorably and often permanently against the entire public office he represents.

7. *An abiding belief in the public importance of the job.* Every public employee engaged in public relations work should not only have a thorough knowledge of his job but should also possess a profound respect for the job. He should realize that his is the responsibility of working not for himself alone but for and in behalf of all the people. Grover Cleveland summed it up as well as could be when he said, "Public office is a public trust." What he said applies with equal weight to all public employment.

8. *Abundance of mental and physical energy, and an unfailing willingness to render service.* The public has the right to be a hard taskmaster, because each and every citizen has an equal right to demand prompt attention and capable service. The public employee therefore is not working just for himself or for a relatively few clients or customers. He

NOTE: *This excerpt from an article published in the June, 1938, issue of the magazine, PUBLIC MANAGEMENT, should be of interest to District employees and the public generally.*
F. E. WEYMOUTH.

is at the service of the entire public. If he does not have the mental or physical energy and stamina to handle this assignment, he should not seek to fill the job.

9. *Courteous and friendly cooperation with fellow employees.* Public relations begin at home. A person who is always courteous, friendly and cooperative in his relations with co-workers may be expected to develop harmonious relations with the public. One who is always standing on his "rights" among fellow workers may be inclined to ignore some of the public's rights.

10. *Loyalty to the service.* A person who has a social, business, fraternal or union fealty paramount to his interest in and loyalty to the public service is unfit for such service. When one serves the public he is obligated to serve all of the public all of the time. A person in public service is either working in the interests of all the people, first and last, or he is working to favor a particular individual or group. No modern sophistry will wipe out this alternative.

Such are a few of the basic qualities and characteristics which should be possessed by persons selected for public relations work in the public service. It is obvious that such qualities cannot fully be gauged in applicants with no previous training. But there are certain visible traits which may go a long way in weeding out the unfit. Such traits can most readily be brought to light by examiners who themselves have had long and successful experience in public relations work.

The first step in training the employee for public relations work, naturally enough, is a course of instruction to provide the employee with a thorough knowledge of the history, functions and purposes of the public service with which he is to be engaged.

In assigning the employee to his duties he should be given full, explicit and detailed instructions.

The employee should be questioned concerning his experiences in meeting the public. He should be encouraged to speak frankly and freely, and should be urged particularly to discuss situations with which he found himself unprepared to cope.

The employee should be encouraged to make constructive suggestions as to ways and means of improving the service to the public. In this connection, it is important always to bear in mind that the first qualification of the employee is that of being able to understand and carry out specific instructions. Only after the employee has mastered this basic requirement may he properly expect to be able to volunteer valuable suggestions for improvements.

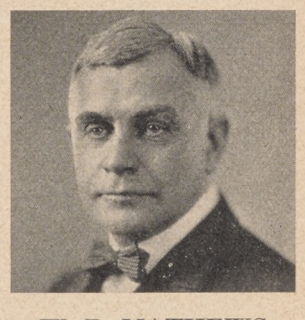
The old-fashioned uniformed patrolman was just about the first public relations man in public service. His official duty was to maintain order and enforce the law. But that was only a part of his public functions. Actually, he *was* the law on his particular beat. He knew the men, women and children who lived and worked in the neighborhood over which he presided. He knew of their joys, their sorrows, and their family problems. They were his people. He was not over them; he was of them. He maintained a bearing of dignity, and he handled the offender with unruffled calmness and unbending devotion to duty. He knew all about the human emotions and the petty misconceptions that are forever getting persons entangled with the complexities of modern government. To be sure, he might drop, now and then, a few kind words concerning the good deeds of the "administration." But who would condemn the virtue of loyalty?

There are a lot of high-pressure public relations experts and self-styled moulders of public opinion who could learn a great deal to their own and the public's advantage if they would take a few leaves from the well-worn Book of Experience of the old-time copper who walked his beat when some of us were kids.

More than 22,000,000 acre-feet of water is now being stored in Mead Lake, according to recent press dispatches from the offices of the Department of the Interior in Washington, D. C. Water behind Boulder Dam has reached a depth of 523 feet, and Mead Lake now extends 114 miles up the Colorado River, the report stated.

Flood waters from the melting snows in the Rocky Mountains have been pouring into Mead Lake for the past several weeks. At the present time the river is increasing the volume of water in the lake at the rate of about 150,000 acre-feet per day, it is reported.

Aqueduct employees who are about to complete their work on the big job are reminded that they may, if they choose, remain on the mailing list of the AQUEDUCT NEWS. Ask your Division Head or Camp Clerk for a mailing list card. Fill it out, giving the address to which you want the NEWS mailed, and send it to the District's Los Angeles Headquarters.



W. B. MATHEWS
1865-1931

For himself, no man asked less. To Southern California, no man gave more.

William Burgess Mathews was born on a farm near Georgetown, Ohio, on March 1, 1865. A few years later he moved with his family to Mason County, Kentucky. There he attended the district elementary and high schools and was graduated from Centre College. He studied law and was admitted to the bar in 1888. Thereafter, he attended for a year the College of Law at Columbia University.

In 1889 he arrived in Los Angeles and entered the practice of law. He was elected City Attorney in 1900. From that day forward, for thirty-one years, he gave his life to the service of the people.

In 1902 Mr. Mathews directed the purchase by the City of the private water company then serving the community. Thereafter, he planned and directed the legal battle that established for all time prior right of the City of Los Angeles to the waters of the Los Angeles River. The lawsuit which secured this invaluable asset for the people of Los Angeles is famed in the annals of water law as the Pomeroy and Hooker case. He successfully guided his city through a maze of lawsuits and political attacks launched by those who were seeking to block the Owens River Aqueduct project and the sale of aqueduct bonds.

Resigning as City Attorney in 1907, Mr. Mathews became the Special Counsel for the City's water and power utilities. Thirteen years later he drew the people's attention to the necessity of providing additional supplies of water and low-cost electrical energy. In this

(*Continued on Page* 16.)

Captain Lynn Davis Smith

Since August, 1936, Mr. Smith has been the real working editor, star reporter and make-up man of and for the AQUEDUCT NEWS. After working nights and holidays in the preparation of copy and art material for this Special Progress Number, Capt. Smith, a few days ago, reported for two weeks of active military service with the 977th Coast Artillery, at Fort McArthur. Certain items which Editor Smith carefully had prepared to go in this space were mislaid by the printer, and so the above photo and this caption were put in as "filler." Mr. Smith has been in the service of the District since February, 1933, first with the Distribution and later with the Miscellaneous Activities Division. He was graduated from U. S. C. in the Class of 1929. He is a Captain in the U. S. Army Reserve Corps. In fact, it is commonly believed, he was the inspiration for the song: "There's Something About a Soldier."—D. J. K.

PARKER DAM PLACED IN OPERATION ON JULY 1

(*Continued from Page* 2)

first two or three forms were lowered into place, but as the opening began to get smaller, the river began to show its teeth and exerted its full pressure against the lowering arch. By the time the forms had been forced down to within five feet of the bottom they were jammed against the face of the portal so tight that even a powerful pile driving hammer could not push them farther. H. P. Bunger, Construction Engineer for the U. S. Bureau of Reclamation, estimated at that time that the river was exerting a force of 2,300,000 pounds against the face of the steel bulkhead.

To overcome the effect of this tremendous pressure, large quantities of steel rails and steel girders were laid on top of the tunnel forms. It wasn't until approximately 150 tons of steel had been so placed that the pile driver could again force the arch down against the river's might.

Hundreds of spectators, the men who have built Parker Dam and their families, lined the bank of the approach cut to watch as operations were once more set under way. Suddenly the stillness of the desert night was broken by the beat of the heavy trip hammer as it pounded against the steel forms. In effect, the arch of the forms created a giant steel kettle drum, 44 feet high and 29 feet in diameter, and as the hammer picked up a fast rhythmic beat the sound boomed up the canyon like the throbbing of ten thousand Indian war drums.

Slowly the forms were forced down —down until the portal of the diversion tunnel was securely closed. Thus, the halted flow of water began the formation of a lake which will eventually reach upstream 55 miles. All the fight had been taken out of the river by the time the portal had been closed, and a few hours later the water of the new lake quietly slipped through the gates of Parker Dam. Another milestone had been passed in the building of the Colorado River Aqueduct.

PATHFINDERS

(*Continued from Page* 15.)

connection he was among the first to recognize the vast potentialities of the Colorado River.

In 1920 Mr. Mathews, with William Mulholland and spokesmen for Imperial Valley, journeyed to Washington and urged the Government to construct a great dam on the Colorado River. From that time until the day of his death, W. B. Mathews never ceased or faltered in his masterful efforts to bring to a successful consummation the Herculean Boulder Dam and Colorado River Aqueduct projects. A large part of the Boulder Canyon Project Act (Swing-Johnson Bill) was written by Mr. Mathews.

Then came the problem of bringing Colorado River water to the thirsty cities of Southern California. There was no legal machinery by which noncontiguous cities could join in such a common effort. To meet this situation, Mr. Mathews conceived the principles and secured the passage of the Metropolitan Water District Act by the California Legislature in 1927.

In 1929 Mr. Mathews became the General Counsel for the District and helped guide it through a program of education which resulted in the people voting, by a 5-to-1 majority, an unprecedented bond issue of $220,000,000 to finance the building of the Colorado River Aqueduct.

Immediately following the adoption of the bond issue in September, 1931, Mr. Mathews set under way the legal task of establishing the validity of the bond issue. On the day before his career was closed by death, the Superior Court handed down its decision upholding in all particulars the validity of the bonds.

It is fair to predict that the unprejudiced historian will recognize that it was the wisdom, the vision, the courage and the legislative strategy of W. B. Mathews which contributed more than any other set of factors to the successful planning and consummation of the Colorado River development program that has taken form as the Boulder Dam and Metropolitan Water District Aqueduct.

June Progress For San Jacinto, 1983 Feet

Establishing the best record that they have made since September, 1936, hard-rock crews in the Potrero heading of the San Jacinto excavated 610 feet of that heading during the month of June. The total progress in the 13-mile San Jacinto tunnel during the month was 1,983 feet, leaving 6,741 feet of the tunnel yet to be penetrated.

Progress during June in the other three headings was as follows: Cabazon, 524 feet; Lawrence East, 419 feet; Lawrence West, 430 feet. On July 1, the distance remaining between the Cabazon and Lawrence East headings was 1049 feet, and 5692 feet remained to be driven between Lawrence West and Potrero.

During the first six months of 1938, the San Jacinto crews excavated a total of 9903 feet of main headings which were driven with a diameter of 18 feet. This excellent progress averages up to 13.68 feet per heading per day, or 4.56 feet per heading per shift.

The San Jacinto tunnel, the second longest on the aqueduct, was started in 1933 and will be the last tunnel on the aqueduct to be completed. On July 1, a total of 11.76 miles of the tunnel had been excavated, and 6.78 miles of this had been lined with concrete and completed.

Considered to be one of the most difficult tunnels of its size that has ever been driven, the San Jacinto tunnel is being constructed as a force account project by the Metropolitan Water District. This and the other tunnels on the main aqueduct have a lined diameter of 16 feet, and have a capacity of 1500 cubic feet of water per second.